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PATENT
365-0428P

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicants: KOISTINEN, Jari et al. Conf.: 6270
Serial No.: 09/402,674 Group: 1751
Filed: October 8, 1999 Examiner: EINSMANN, M.
For: POLYOL AND COMPLEX ESTERS FOR USE WITH, IN PARTICULAR,
FLUORINATED REFRIGERANTS

DECLARATION SUBMITTED UNDER 37 C.F.R. 1.132

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

I, Salme KOSKIMIES, do hereby declare the following:

I am a citizen of Finland.

I graduated from Brandeis University, U.S.A. in 1977 with a PhD in Physical and Organic Chemistry.

I worked as an R&D Fellow with Neste Oy (Neste Oyj) from 1991-1998 and subsequently with Neste Chemicals Oy from 1998-2001. I participated in the development of compositions described in the above-identified application.

I currently hold the position of Group Manager at VTT Processes, Processes and Environment, Espoo, Finland.

I am familiar with the contents of the above referenced patent application, as well as the current processes used for producing the polyol and complex esters for use with fluorinated refrigerants.

I have read and understood the subject matter of the Office Actions of December 6, 2000, August 23, 2001 and November 14, 2002.

I have read the Nakahara et al. (US Patent No. 5,374,366) reference and offer the following comments in support of the patentability of claims 17 and 19-26 of the instant application.

1. The present invention is directed to refrigerant compositions comprised of a chlorine-free hydrofluorocarbon based refrigerant and a mixture of polyol esters. The instant compositions are good lubricants and exhibit good or excellent solubility in fluorinated refrigerants. The inventors were the first to recognize that combining HPHP (hydroxypivalyl hydroxypivalate) with another polyol such as neopentyl glycol (NPG), 2-butyl-2-ethyl-1,3-propanediol (BEPD), 2-ethyl-1,3-hexanediol (ETHD), trimethylol propane (TMP), 2,2,4-trimethyl-pentanediol (TMPD), trimethylol ethane (TME) or pentaerythritol (PE) and a monocarboxylic or a hydroxy acid, or a mixture of mono- and dicarboxylic acid would produce complex esters with these improved properties.
2. The Examiner has argued that Nakahara describes all of the glycols and carboxylic acids used in the present invention and further describes the formation of mixed esters citing to Example 10. The Examiner states that the Nakahara reference only differs from the present invention because it does not use one of the instantly claimed glycols. I disagree. A person of ordinary skill in the art would not be motivated to substitute one of the claimed polyols for neopentyl glycol in the process of Nakahara's claim 10 to arrive at the present invention because the Nakahara reference does not disclose or suggest that the solubility of the polyol esters can be improved by altering the molar ratio of HPHP in the polyol ester or by changing the identity of the second polyol.
3. The complex esters of HPHP according to the present invention exhibit good lubricant properties and improved solubility as HFC compounds used as refrigerants. It is very difficult to predict the solubility of polyol esters in refrigerants. The present invention teaches that solubility can be improved by increasing the concentration of HPHP relative to the other polyol as demonstrated in Table 4 of the application. Preferably, the polyol ester is comprised completely or almost completely of an ester of HPHP and the lower limit is determined by the second polyol used. The present invention also teaches that mixtures of different polyols impact the overall solubility of the polyol esters in the refrigerant. The results in Table 4 demonstrate that the solubility of the polyol ester increases as the molar ratio of HPHP in the

composition increases. When the molar ratio of HPHP in the composition increases, solubility increases. In Table 4, samples 7 and 9 are identical with the exception of the polyol but exhibit differing solubilities because of the sample 7 uses BEPD whereas sample 9 uses NPG. Samples 6 and 8 use the same polyols but sample 8 exhibits improved solubility because the molar concentration of HPHP is significantly higher. Finally, samples 8 and 10 contain the same polyols in the same relative concentrations and exhibit the same solubility in R-134a despite the fact the concentration of the esterifying carboxylic acids. These results clearly indicate that the molar ratio of HPHP and the identity of the second polyol in the polyol ester influence the polyol ester's solubility in the refrigerant.

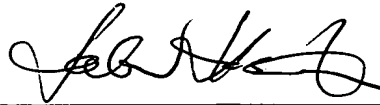
4. I also believe that the present invention is novel and non-obvious in view of the Nakahara reference. The instant compositions are produced by esterifying the polyols *in situ* or within the same vessel in a single step. The process used to prepare the instant compositions is more economical and efficient than the prior art processes, including that described in Nakahara. The process also uses commercially available HPHP (CAS-1115-20-4) supplied by Eastman (US) and BASF and Krahn (Germany). Using commercially available HPHP is easier than preparing HPHP using the "Tischenko" reaction or as described in Nakahara, example 1 because one does not have to perform post-treatment or purification. In addition to saving time, the use of commercially available HPHP results in significant cost savings because these additional processing steps are eliminated. It is difficult to give estimation for cost savings, but if special equipments are needed the feasibility of the whole process can be questionable. Fortum's invention is more simple to apply in production.
5. The HPHP used in the instant invention differs from the HPHP obtained from Example 4 or 10 of Nakahara. Example 4 of Nakahara describes the preparation of HPHP from HP acid and neopentyl glycol (NPG). The reaction between HP acid and NPG always forms some longer chains. The Nakahara reference discloses esterification of hydroxyisobutyric acid with NPG as a first step which leads to a structure that has more NPG units than in the present invention (where pure HPHP is used as a starting material). Consequently, a product of a different structure is reached. The same holds true for the preparation of HPHP in Example 10 of Nakahara. The hydroxypivalic acid neopentyl glycol monoester of Example 10 was prepared in the same manner as Example 1. Commercial HPHP rawmaterial (industrial grade) produced by Basf, Eastman and Sydsvenska Kemi can be used (and was used) without extra purification step in example 1. The foregoing remarks demonstrate that the molar ratio of HPHP in the polyol ester, as well as its quality, influence the solubility of the polyol ester in the refrigerant.

6. In my opinion, the present compositions represent an improvement over the prior art because they provide polyol and complex esters which can be used together with fluorinated refrigerant liquids as lubricants. The improved solubility of polyol esters comprised of HPHP and NPG, BEPD, ETHD, TMP, TME or PE was not described or suggested by the prior art. Moreover, the present inventors were the first to recognize that solubility could be improved by altering the molar ratio of HPHP in the polyol ester or by changing the identity of the second polyol. Thus, the properties of the instant compositions can easily be modified depending on the application.

The undersigned hereby declares that all statements made herein are based upon knowledge are true, and that all statements based upon information and belief are believed to be true; and further, that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Dated: _____

25.6.2003



Dr. Salme Koskimies